

Using Response Cards to Increase Student Participation in an Inclusive Classroom

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Abstract

One of the most challenging aspects facing educators today is ensuring academic success for all students in the classroom. Many teachers feel that increasing participation levels of students during instructional time afford students the best chance of academic success. This study analyzed the use of response cards in an eighth grade inclusion math classroom to increase student participation and academic achievement. An AB design study was used to collect data on five students who represented the classroom population of students with and without disabilities. Lesson materials were delivered under two conditions, hand-raising and write-on dry erase board response cards. Results indicated a significant increase in student participation and on-task behaviors during the response card phase. Scores on weekly quizzes and end of unit tests increased after review lessons were conducted with response cards. Recommendations for future studies are included.

Keywords: response cards, student participation, students with disabilities, inclusion

Introduction

One of the most prevalent trends in education today is providing all individuals, regardless of ability, equal access to the general education curriculum. Many students with disabilities have been allowed to shed the restraints of the self-contained classroom and spend the vast majority of their day in regular education classrooms. Thus, inclusive classrooms have become the norm of school systems across the country, thereby allowing students of all ability levels to share time receiving instructional material from both regular and special education teachers in the same setting. While inclusive classrooms present all children with the opportunity of equal access to the classroom materials, they do not guarantee success in the classroom for all students.

Response Cards Defined

Response cards are one type of teaching strategy in which students respond simultaneously to teacher prompts using a card with pre-written answers, yes/no answers, the use of a white board, interactive white board, or any other technology. The teacher then uses students' responses as an assessment for learning. Teachers from elementary through secondary education can benefit from using response cards.

Response Card Effects

[7] Heward, (1994) found that using teaching strategies at any grade level, such as response cards, which promote a high level of active student response increases learning, provides feedback to the teacher, and is correlated with an increase in on-task behavior. [8] Randolph (2007) acknowledged that the major difference

between hand raising and response cards is that using response cards allows multiple students to respond to questions presented by the teacher instead of the lone responder via hand raising. The teacher is also afforded an opportunity to provide immediate feedback to those students displaying incorrect answers. When compared to passive instruction techniques such as hand raising, employing active learning strategies such as response cards increases quiz and test achievement scores, increases student engagement and participation rates, and results in students displaying less off-task behaviors during instruction time.

[1] Berrong, Morse, Schuster, and Collins (2007) studied the effects response cards had on student participation and social behaviors of students with moderate and severe disabilities. The ABAB designed study utilized a target population of eight elementary-aged students aged 10 to 12 years with moderate and severe disabilities in self-contained special education classrooms. Results of this study mimicked the results of other studies in that active student responses increased from using response cards when compared with responses elicited via traditional hand raising methods. Mean averages increased from 21.7% to 58.8%. On-task behaviors also increased with mean averages rising from 35.7% to 74.9%. Inappropriate behaviors also increased as students switched back to hand raising responses after using the response cards. The study conducted by Berrong, et al. (2007) concludes that response cards are an effective intervention to increase active participation rates, increase student engagement, and promote on-task and appropriate behaviors of students with disabilities.

Response Cards in Elementary Settings

[3] Christle and Schuster (2003) examined the effects response cards had on student participation, academic achievement, and on-task behavior in an elementary school setting. The ABA designed study investigated rates of the aforementioned variables after using response cards during whole-class math instruction in a fourth grade classroom consisting of 24 students ranging from age 9 to 11. During both A sections, the traditional hand raising response format was used. In the B section, response cards were used as means of student response. The researchers acknowledged that the traditional format of questions and answers used by most teachers resulted in mainly the higher-achieving students raising their hands or the teacher calling on these student to ensure that a correct response was given. Meanwhile, mid and low-achieving students rarely raised their hands and had fewer opportunities to actively participate in the learning process. This study investigated the number of student-initiated responses, the number of student responses, time on-task, and scores of weekly quizzes. The findings of this study are in agreement with other studies investigating the same dependent variables. The total number of student-initiated responses increased as well as the correct number of student responses. Time on-task saw a dramatic increase as nearly all students remained engaged and behaved appropriately during the intervention period. When reverting back to the hand raising phase of the study, quiz grades returned to their pre- intervention levels.

[5] Gardner, Heward, and Grossi (1994) compared rates of participation, academic success, and on-task behaviors between elementary students who used response cards versus students who used traditional hand raising methods. Rather than comparing results of the variables on students with and without exceptionalities, their study expanded the parameters by conducting an inquiry that utilized a target population of 22 students aged 10 to 12 years in a low socioeconomic neighborhood, inner-city classroom. This study compared results regarding the number of student responses and accuracy of student responses. As a result, mean scores increased from 49% after using instruction that incorporated hand raising responses to 70% after utilizing the intervention of response cards. Student satisfaction rates were also higher after using the response cards with 20 of 22 students expressing that response cards helped them get a better grade than hand-raising did. Although the subjects were from vastly different backgrounds as other study participants, the results of this study replicated the results of previous research and further demonstrated that using active learning techniques such as response

cards can lead to an increase in student participation, active engagement in instruction, less disruptive behavior, and enhanced academic achievement for all students regardless of ability level or socioeconomic status.

Response Cards in Middle School Settings

[6] George (2010) conducted a study with twenty-nine middle school students with emotional or behavioral disorders in sixth through eighth grade. The study compared results after using response cards versus traditional teacher-led instructional methods. Data was then inspected to search for correlations between the use of response cards and increases or decreases in five areas: 1) chapter posttest scores, 2) academic responding, 3) correct responses, 4) on-task behaviors, and 5) student satisfaction. The findings indicated a positive correlation between using response cards and gains in all five areas of investigation. Mean posttest scores increased 9.55 percentage points with 88 % of students increasing their scores after failing a test that was given following instruction via traditional methods. Mean increases were also seen in student responses since 54% more responses were given by students using response cards than traditional hand raising methods. Correct academic responses also increased on average by 36%, and on-task behaviors increased by 9 %. Students reported high satisfaction with response cards, and most of the students reported that they retained more information and listened more on days when the response cards were used than they did when traditional instruction was used. Although George's (2010) study only used students with disabilities in a support classroom setting, the findings reach similar conclusions as other studies that were conducted in inclusive and general education classrooms; response cards increased student participation, increased on-task behaviors, and promoted academic achievement of all students regardless of ability level.

Response Cards in High School Settings

Students in secondary education have also benefited from response cards. [4] Duchaine (2011) compared participation rates, on-task time, and academic scores on formative assessments of students using the traditional hand raising method versus the intervention strategy of response cards. Conducted at the high school level, the population of the alternate treatment study was general education students and students with behavior problems. Upon completion of the study, data collected allowed the author to conclude that her research concurred with previous findings that response cards positively influenced student engagement, lengthened on-task time, reduced incidences of disruptive behaviors, and increased student participation. Furthermore, response cards increased academic achievement by higher assessment scores and longer periods of material retention with that particular sample of students.

[2] Cavanaugh, Heward, and Donelson (1996) also devised a study at the secondary level that also investigated the effect that response cards had on assessment scores. The study was conducted using 23 ninth-grade high school students, of which, 8 were identified as students with disabilities or at-risk students. An alternate design method of active participation using response cards and passive learning using fill-in-the-blank review notes was used to collect and compare data to assess recall of lesson material and scores on formative assessments. The findings indicated a higher amount of student participation using response cards which also correlated with higher scores on both next-day quizzes and end of the week tests. According to the findings, 13 of 15 general education students and all of the special education students received higher scores on next day tests and end-of-the-week tests than on tests given before the intervention of response cards were implemented. Teachers also reported higher levels of student attentiveness and engagement during the response card sessions when compared to fill-in-the-blank reviews. Additionally, using response cards provided feedback for teachers which allowed them to correct any misconceptions before progressing forward.

Regarding the use of response cards, much of the research points to a positive correlation between active student participation and success in the classroom; instructional strategies that increase participation among students, including exceptional students, tend to promote greater levels of academic success (Duchaine, 2011; George, 2010). Therefore the purpose of this paper is to see if using response cards with 5 middle school students will increase student participation and academic success.

Method

Participants

Five students from a 6th grade rural, Title 1, elementary school in Georgia were randomly selected to participate in the study. Two of the participants were general education students, two were students with disabilities, and one English as a Second Language (ESL) student. Three of the five students were boys. All students in the class participated in the study activities; however, only data collected on five target students were reported in the research findings.

Two teachers participated in the study. The regular education classroom teacher was a Caucasian male with three years teaching experience. He was certified in middle school mathematics and Secondary Social Science and had completed a master's degree in Secondary Education. The co-teacher was a Caucasian female with 4 years teaching experience, certified in special education and middle school mathematics and language arts, and had completed a master's degree in special education.

Setting

The classroom used during the study consisted of 30 student desks arranged in five rows of six desks in a column facing an interactive Promethean Board and large dry-erase whiteboard in the front of the room. The teachers used an interactive slate to perform mathematical computations on the Promethean Board which allowed for free movement to monitor student progress. The teacher's desk sat in a corner of the room adjacent to the whiteboard. A large rectangular table in one corner of the room was used by the teachers to differentiate instructional materials to struggling students.

Experimental Design

An AB design treatment was used to compare the effectiveness of utilizing traditional hand-raising techniques (the baseline) versus the use of individual dry-erase white boards (the intervention) on the dependent variables *student participation* and *academic achievement*. An AB design treatment was used to observe the effect of single student responses observed using traditional hand-raising responses compared with the number of responses made by the target population using individual dry-erase white boards during whole class instruction. The design consisted of establishing a baseline followed by an intervention after which comparisons were made to determine the effects of the intervention on the dependent variables of student participation and academic achievement. During the study, both types of student response options were utilized by the teachers during daily review sessions conducted at the beginning of each class period as well as during instructional time. This study was conducted over a six week period separated into two, three week phases. The first phases occurred during the first three weeks followed by the intervention phase the remaining three weeks.

During the A Phase of the study, the teachers encouraged students to enter classroom discussions through hand raising; thus, no special materials were used during classroom instruction. During the intervention (Phase B),

student response cards were utilized by all students. The response cards were individual 8.5" x 11" dry-erase whiteboards purchased by the participating school at the beginning of the year. During this study, the whiteboard response cards were kept in the classroom and distributed to students at the beginning of class. Additional materials supplied to students included dry-erase markers and a small rag to be used as an eraser. Each student kept his/her dry-erase marker and eraser in their math binders for use each day. To ensure 100% participation in the study, any student without the necessary materials was issued temporary supplies for that day.

Procedures

Both teachers noted the relative ease in which the response card intervention was incorporated into the lesson during whole-class instruction. The intervention was easily implemented because students used them to respond to their math lessons on a daily basis. For the teachers, increased use of response cards throughout the entire lesson rather than as a bellringer aid was the only alteration to classroom instruction needed.

Both phases in this experiment possessed the following characteristics. Each session lasted 75 minutes. The first few minutes of each class were dedicated to students answering a bell-ringer question on their white board while the teachers checked homework for completion. This bell-ringer was a question from any material covered from the first day of school to the previous days material. The remainder of the period consists of: a "Quick Check" to review previous material; homework review; presentation of new material; guided practice; differentiated group work based upon mastery of current material; independent practice for some students while the teachers helped struggling learners; and homework assignment. During the review, presentation of new material, and guided practice sessions, specific questions were asked to assess student comprehension.

During the A phase of the study, the teachers conducted class following their normal routine of encouraging students to raise their hands to participate in classroom discussions. The teachers would present material and at brief intervals, would stop and ask a specific question while instructing the students to raise their hands to in order to respond. The teacher(s) would then call upon one student to answer the question. If the student answered correctly, praise was given by the teacher; however, if answered incorrectly, the teacher would provide feedback before moving on to the next topic and question. The other teacher observing the interaction noted the students who raised their hand, their response to the question.

During the B Phase of the study, the teacher conducted class similarly to the A phase of the study; however, when he asked a question during this phase, students were instructed to write an answer onto their whiteboard. After issuing the question, the teacher would begin a 10 second countdown beginning at 10 and ending at 1 at which point he would give the command "boards up". The students would then hold their boards high above their heads for the teachers to see. The teacher counted the correct number of responses and offered immediate feedback to the students who had the incorrect answer written on their board. The other teacher, as the observer, noted how many students responded by answering on their boards and tallied the number of responders compared to the opportunities to respond during the 75 minute math period.

During this study, the teacher used the whiteboard response cards to differentiate instruction and assess which students "got it" and which students did not. After a period of instructional time elapsed, written responses to target problems let the teacher know which students understood the concept being taught and which did not. Those students who answered the problem correctly were allowed to move ahead to more difficult/ different types of problems within the same concept while those students who answered incorrectly, remained with the teacher and were given different instruction to clear up student misconceptions based on responses written on the cards. After a brief period of altered instruction, the teacher presented these students with another target problem to work out on their whiteboard. This process continued until all students demonstrated mastery of the

concept. If only a couple of students needed further remediation, the teacher would conduct small group sessions with the students while the remainder of the class continued working independently.

Dependent Variables

There are two dependent variables in this study: 1) student participation and 2) academic achievement. Student participation was measured in two ways: positive on-task behavior and attempted responses. Academic achievement was measured through weekly quizzes and unit tests that were taken before and after interventions with response cards.

On-task behavior was defined as looking and listening to the teachers, looking at the Interactive Promethean Board, hand-raising or writing an answer on a whiteboard when asked for a response by the teachers. Student data were collected at the end of five minute intervals during daily review sessions using a frequency recording. The data was reported as an average percentage of positive on-task behaviors observed in a seventy-five minute class period. During the review session, as one teacher conducted the question/answer segments the other teacher made tally marks of positive behaviors observed for target students. The number of tally marks was then noted on a data-collection sheet divided into 15 separate sessions, one for each five minute interval. A time sample recording was used for observances of on-task behavior. If the target students were academically engaged during the sample period a check mark was placed in the appropriate box on the data sheet. If the target student was observed displaying off-task behaviors an x was placed on the data sheet for that student during that time frame.

Attempted responses were defined as using two criteria- one for hand-raising and one for response cards. For hand-raising, attempted responses were tallied each time a target student expressed a desire to answer a teacher's question during instruction of the material, or any time a student attempted to answer a question when called upon by the teacher. During the response card phase, attempted responses were tallied each time a target student wrote an answer to a question posed by the teacher. The number of times a student responded was divided by the total number of times the student had an opportunity to respond.

Quizzes were given every fifth day and were teacher-created questions similar to classroom instructional material or exact questions asked during the current weeks daily review sessions. Each quiz consisted of approximately 15 multiple choice questions. The answers were scored as a percentage of questions answered correctly out of the 15 questions possible to give a mean for the pre and post intervention analysis.

Unit tests were given according to the Georgia Board of Education pacing guide. Each unit consisted of approximately 17 days and covered four different standards with each standard comprising two or three strands. Each unit test consisted of 25 standards-based questions. After a comprehensive review session, students were given a study guide with similar types of test questions to prepare them for the test. No pre-tests were given for either of the unit tests. Therefore, only data from the summative assessments were used for comparing increases or decreases in rates of the student's academic achievement.

Results

Student Participation

Figure 1 shows the time spent on-task for the target students for each hand-raising and response card session. Data for on-task behavior was gathered through observations of desired behavior at the end of five minute intervals during the 75 minute class period. Mary's average percentage of on-task behavior was 82.5% during the hand-raising phase and increased to 100% during the response card phase. David's average percentage of

on-task behavior was 49% during the hand-raising phase but increased to an average of 83% during the response card phase. Donald displayed a high level of consistency during both phases of the study. During the hand raising phase, he was observed to be on-task for an average of 83% of the sessions and remained on-task for 100% of the sessions during the response card intervention phase. For Steven, the average percentage of on-task behaviors displayed was 47.5% during the hand raising phase but increased to 96% during the response card phase. Rebecca proved to be the most consistent of all target students examined. During both phases of the study, hand-raising and response cards, she was observed to be on-task for 100% of the sessions.

Attempted Responses

Table 1 shows the number of student responses during each phase of the study. Opportunities to respond were measured for the five target students by noting the number of times students responded during each phase of the study. During the hand raising condition, the teacher asked an average of 18 questions per session (20, 15, 20, 19, 18, 20, 15), and he asked an average of 17 questions during the response cards phase (10, 12, 19, 25, 20, 17, 19, 16).

Table 1. Attempted Student Responses

Total Number of Student Responses Observed During Hand Raising and Response Card Phases

Condition	Session #	Mary	David	Donald	Steven	Rebecca
Hand Raising	1	0	0	100	0	3
Hand Raising	2	0	0	100	0	3
Hand Raising	3	2	0	100	0	3
Hand Raising	4	3	0	100	0	2
Hand Raising	5	0	0	100	0	3
Hand Raising	6	6	0	100	0	3
Hand Raising	7	1	0	100	0	3
Response Cards	8	5	0	100	0	2
Response Cards	9	10	10	100	0	100
Response Cards	10	20	11	100	11	100
Response Cards	11	24	21	100	24	100
Response Cards	12	15	17	100	19	100
Response Cards	13	19	15	100	16	100
Response Cards	14	24	16	100	18	100
Response Cards	15	17	13	100	16	100

Mary infrequently raised her hand to respond to teachers’ questions during the hand raising phase. She volunteered to answer only 12 questions of the 127 total questions asked by the teacher resulting in an 11% average for the first phase. Her average increase dramatically during the response card phase as she responded to each question asked by the teacher for a rate of 100%. David did not volunteer to answer any teacher questions during the hand raising phase but increased his average to 85% during the response card phase. Donald raised his hand to respond to each question presented during the first phase of the study for a 100% response rate. He also wrote a response on his whiteboard 100% of the time during the intervention stage. Steven did not raise his hand to answer any questions during the hand raising sessions but his average increased greatly during the intervention phase due to the fact that he wrote responses on his board to 95% of the teacher’s

questions. Rebecca also demonstrated gains from the hand-raising to response card phase of the study. She volunteered to answer 15% of the questions asked during the hand raising phase and 100% during the response cards sessions.

Four of the five students increased their response averages greatly following the implementation of the response card intervention. Steven demonstrated the greatest gains of all the target students with respect to the average number of responses during the two phases; he responded 0% of the time during the hand-raising phase but participated 95% of the time during the response card phase. The fifth student, Donald, demonstrated no gains in the response card phase because he responded to all of the teachers' questions during both the hand-raising phase as well as the response card phase.

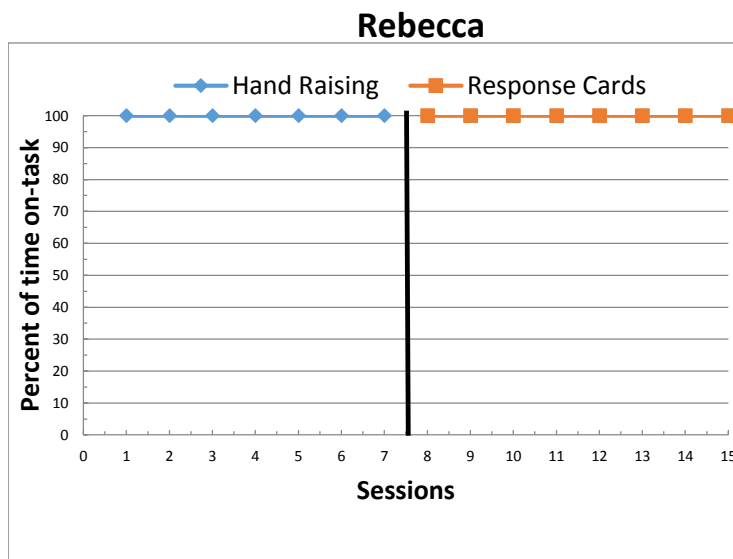
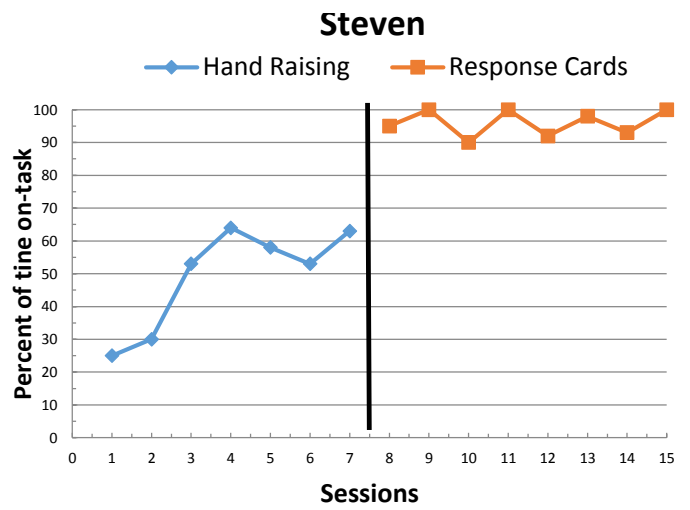
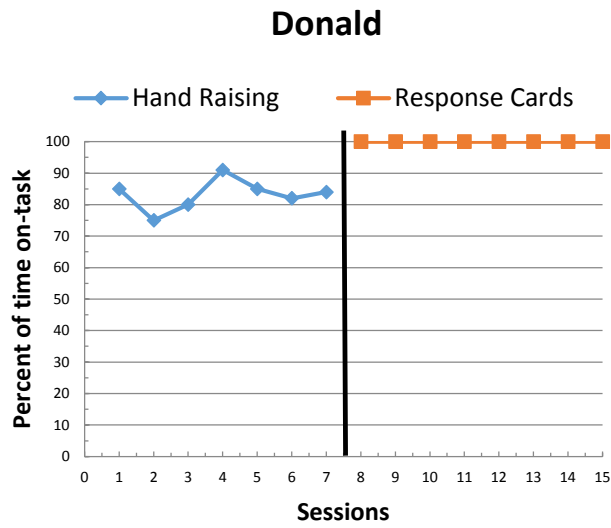
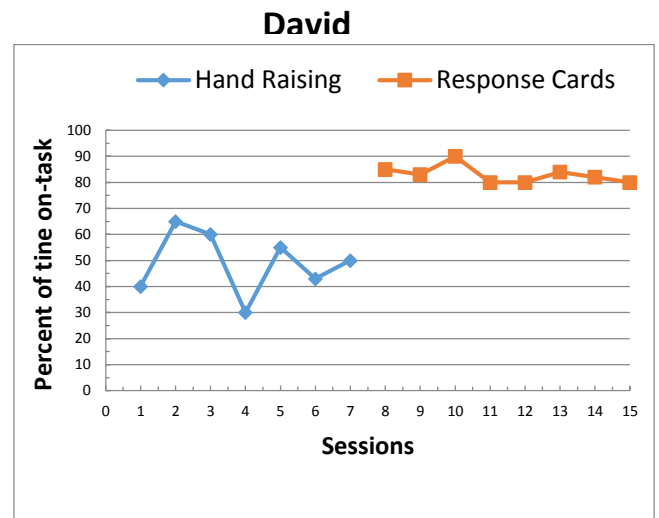
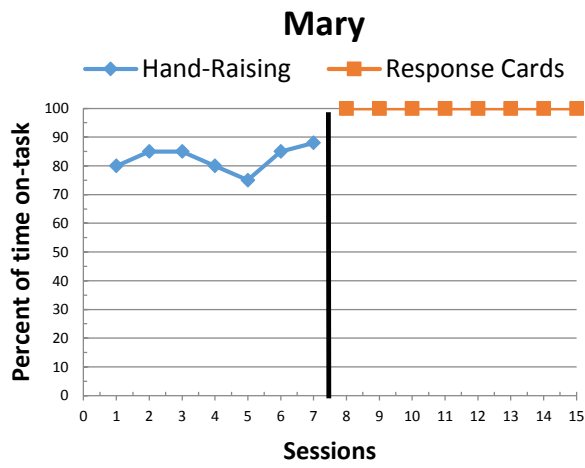
Weekly Quiz Scores

Table 2 lists the quiz scores of the target students after each phase of the study was completed. Data was collected after target students took three quizzes before and after the intervention strategy was introduced. The scores on the three quizzes (worth 100 points each) were added together and divided by 300 and then multiplied by 100% to arrive at an average percentage score for each target student. Mary improved her quiz scores by an average of 11% from the hand raising phase to the response card phase. Her three quiz average for the hand raising phase was 77.7%. She scored on average 88% after the intervention. David's three quiz average during hand raising was 73.7%. His average scores after using the response cards was 80%. This resulted in a 6.3% increase in averages. During the hand raising phase, Donald averaged 77.3% for the three quizzes given. Following the use of response cards, his quiz average increased slightly to 81.7%, a 4% increase. Steven improved his scores slightly following implementation of the response card intervention. His pre intervention quiz average of 51% increased to 60% after using the response cards. Rebecca also improved her scores from the hand raising phase to the response card phase. Her three quiz average during hand-raising was 83% and following implementation of the response card strategy her average for the quizzes increased five percentage points to 88%.

Unit Tests

Figure 1 shows the scores that all five target students received on unit tests administered after the teacher used the traditional method of hand raising to conduct review sessions compared with the scores on assessments after response cards were used in the classroom. Mary scored a 52% on the unit test administered following the hand raising phase and a 79.5% after using response cards for an increase in achievement of 27.5%. David received a score of 66% after review sessions were conducted using hand raising methods. The score he received on his next unit test following the use of response cards during review sessions increased 7.5 percentage points to 73.5%. Donald increased his unit test average slightly as he realized an increase of 4 percentage points. His hand raising grade was a 67% and his grade following the use of response cards was 71%. Steven, although he did not demonstrate a high post-intervention score raised his test scores 12% from a pre-intervention grade of 16% to a post intervention score of 28%. During the hand raising phase, Rebecca scored an 86% on the unit test. Her scores following the introduction of response cards resulted in a score of 94% on the subsequent unit test for an eight percentage point increase in average.

Figure 1. Comparing Students' Time On-Task Between Hand-Raising and Response Card Sessions



Discussion

The results of this study add to the literature base that response cards effectively increased student participation rates and academic achievement of sixth grade students in inclusive classrooms during whole class instruction. When response cards were used during the intervention phase, students were on task more often and participated more during class discussions. It was frequently noted that during hand-raising sessions, the students who were willing to actively participate and answer questions were primarily those students who raised their hands. Familiarity with the students' characteristics allowed the teachers to note that these frequent responders were the higher-achieving, more self-assured students in the classroom. Other possible reasons are that students who did not raise their hands may have feared ridicule by their classmates, had been ridiculed in the past for giving the wrong answer, or failed to initiate a response because they were not prepared.

Particularly noteworthy is the fact that averages of on-task behaviors for all students in the classroom were also lower during the hand-raising phase than during the response card intervention phase. The average percentage of on-task behaviors for the students was 95%. Three of the target students demonstrated positive on-task behaviors at each interval of the observation period for a 100% on-task rate. In contrast, during the hand-raising phase the rates of on-task behaviors for the target students revealed that the two students without disabilities and the lone ESL student were on-task 89% percent of the time while the two students with disabilities were on-task 52% of the time. The students who were observed to be off-task commented that they were getting more materials to take notes and were listening to the teacher even though they were not looking directly at him or the Promethean Board at the particular time. Nevertheless, those incidences were counted as off-task behaviors by the observer and recorded as such.

During the hand-raising phase of the study (Phase A), each of the target students exhibited a reluctance to voluntarily answer questions, with the exception of Donald who raised his hand in an attempt to answer each question posed by the teacher. The use of response cards, however, increased the frequency of active student response during whole-class instruction. The pre-intervention average for the target students was 25.2%. Following the implementation of the response card intervention, however, the average percentage of attempted responses increased significantly. Three of the five target students attempted to answer every question posed by the teacher for an overall group response rate of 96%. The mean difference between responses made during hand-raising and response cards on average increase was 70.8% following the introduction of response cards.

Response cards are very effective instruments for teachers in addition to students. The cards give educators the opportunity to perform formative assessments of student comprehension, provide feedback, and alter instruction immediately to clear up student misconceptions of classroom material. Traditional hand-raising instructional techniques limit the teacher's ability to assess only a few students, usually the higher achieving students, during whole class instruction due to the fact that only one student at a time can respond to each question. In contrast, using the response cards allowed the instructor to rapidly scan responses from every student, assess their levels of comprehension, and provide immediate feedback to promote a deeper level of understanding.

Findings from this research study further supports the available literature concerning the positive effects response cards have on active participation and academic achievement. Similar to other studies, active participation was associated with greater academic achievement gains than when other procedures were employed, and resulted in increased averages by all segments of the student population including student with disabilities and English Language Learners. The target students in this study, when separated into subgroups of students without disabilities and students with disabilities, showed average increases at roughly the same rate. The averages of the two students without disabilities and the ESL student increased on average 7% while the weekly quiz averages of the two students with disabilities increased on average 7.4%

Test scores also increased during the intervention phase of this study. Results from this study found that the average percentile scores for all target students increased after the intervention phase. Test scores increased on average 12% for the target group. Similar to averages on weekly quizzes, a comparison of the test scores of the two subgroups revealed increases along the same increments.

While student participation and student responses increased during this study, an increased emphasis is placed on the gains garnered concerning academic achievement. The fact that all five target students increased their weekly quiz scores and unit test scores significantly after the intervention indicates that a positive correlation exists between the use of response cards and academic achievement. Based on the abundance of research indicating the positive effects of using response cards in the classroom, the results of this study corroborate other studies in that the target students in this inclusive classroom increased significantly on all variables studied. See table 3 below.

Table 2. Weekly Quiz Scores

Quiz Grades: Average Percentage Correct on 3 Quizzes for Each Student During Hand Raising and Response Cards					
Phase	Percent Correct				
	Mary	David	Donald	Steven	Rebecca
Hand Raising	77.3	73.7	77.3	60	83
Response Cards	88	80	85.6	60	86

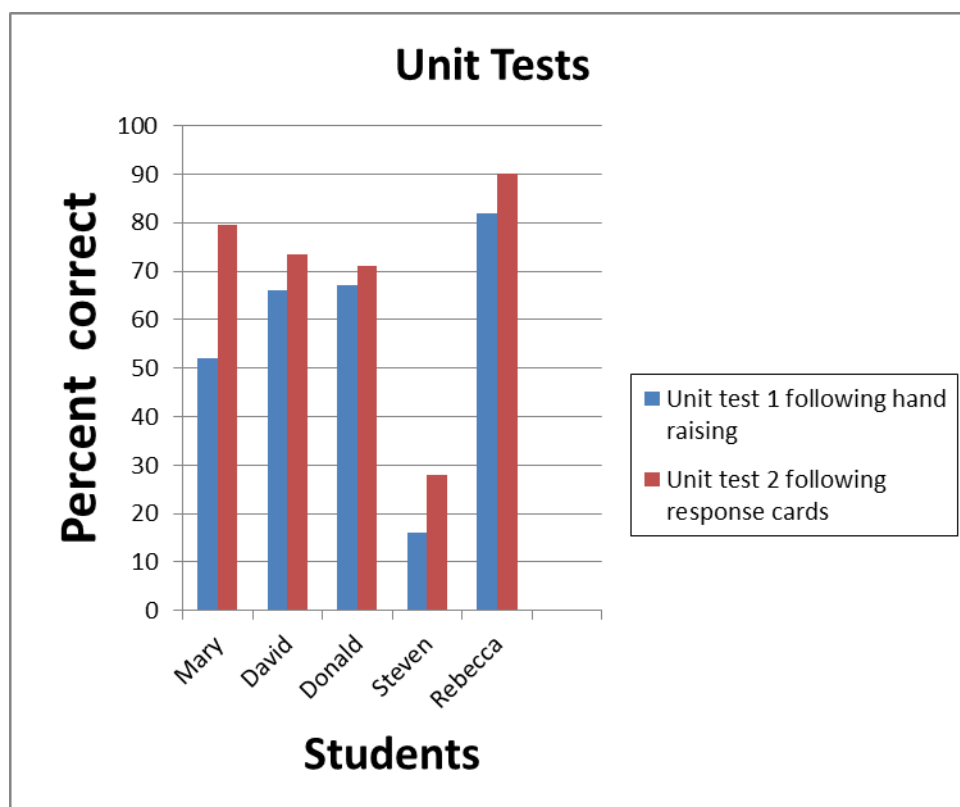


Figure 1. Unit Test Scores

Recommendations

Findings from this study highlight the effectiveness of response cards; however, several limitations and recommendation for future research must be noted. The short time frame was one such limitation. Suggestion for future studies should include a second intervention and an ABAB design with a shorter time frame between interventions. This would allow for more data to be collected and offer a more thorough examination of the effects of the intervention on participation rates and academic achievement. Furthermore, using the ABAB design study would allow future researchers to establish if a correlation exists between long term recall abilities and the use of response cards. For instance, suggested time frames for future studies would include data taken from benchmark exams which typically divide a school year in half and assess students over a wide array of concepts rather than one or two units of instructional material.

Although all students participated in the research activities in this study, another limitation is that only data collected on five target students was utilized to report the findings. While the students were randomly selected to represent the dynamics of the classroom population, the small sample number restricts the ability to generalize the findings to whole class populations across a wider spectrum. Therefore, the use of a small sample size, such as the one used in the present study, requires that future research on the dependent variables would need to be conducted in order to replicate the findings from this study. Consequently, future research should employ a larger number of sample students from a variety of backgrounds and different ability levels to establish if a correlation exists between the intervention and the hypothesized outcomes of increased student participation and academic achievement. Using different student groups of mixed ability levels to replicate the finding of this study would serve to strengthen the argument of the effectiveness of response cards as an intervention strategy for students of all ability levels.

This study was conducted in one inclusive mathematics classroom at the eighth grade level. This narrow scope limits the ability of the research findings to be generalized across various content areas and grade levels. One recommendation for future research is to conduct simultaneous research in other disciplines such as social studies, science, and language arts in alternate grade levels in order to compare the effects to those in math classes. Additional research should also be conducted in math classrooms across grade levels to compare results in an interdisciplinary fashion. A study conducted across disciplines and grade levels would present researchers with a more in-depth understanding of the positive effects response cards can have on active student participation and academic achievement.

Further replications of this study are desired so that researchers have an opportunity to generalize the results to other disciplines as well as to other classroom populations. It would be helpful to know if the results garnered from this study would be achieved from different students and with other teachers implementing the intervention. Although this study was conducted in an inclusive classroom, the available data for success rates of students with disabilities is limited. Therefore, future research using response cards should be conducted on students with mild to severe disabilities or extreme behavioral issues to surmise if the intervention would have the same positive effects reported in the present study.

The use of response cards has been shown to positively influence student participation rates, increase on-task behaviors, and promote academic achievement in students of all ability levels. Additionally, students and teachers alike reported a strong preference for using the cards during classroom review session; the cards turned students into active participants in the learning process. Enjoyable, low cost, and ease of use make response cards an effective tool for every educators teaching repertoire.

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